

ICT in the National Health System

The Healthcare Online programme



Summary

plan
avanza2»»



GOBIERNO
DE ESPAÑA

PlanE
Plan Español para el Estímulo de
la Economía y el Empleo



MINISTERIO
DE SANIDAD
Y CONSUMO

MINISTERIO
DE INDUSTRIA, TURISMO
Y COMERCIO

SECRETARÍA DE ESTADO
DE TELECOMUNICACIONES
Y PARA LA SOCIEDAD DE
LA INFORMACIÓN

ICT in the National Health System:

The Healthcare Online programme

Document prepared by:

Red.es
Health Departments of all autonomous regions
INGESA (Ceuta and Melilla)
Ministry of Health and Consumer Affairs

PUBLISHER:

© red.es
Edificio Bronce
Plaza Manuel Gómez Moreno, s/n
28020 Madrid

Legal deposit: M-4721-2009

Layout and Production: Scan96, s.l.

Reproduction, distribution, public communication or transformation by any means and for any purpose is permitted provided that the authors are expressly and prominently acknowledged.

Contents

	FOREWORDS by: Sebastián Muriel Herrero and Pablo Rivero Corte	7
01.	INTRODUCTION	11
02.	AVANZA PLAN HEALTHCARE ONLINE PROGRAMME	13
	2.1. Objectives and Actions	14
	2.2. Results	18
	2.3. Contributions of the Programme	21
03.	STRATEGY OF THE MINISTRY OF HEALTH AND CONSUMER AFFAIRS. NATIONAL HEALTH SYSTEM QUALITY PLAN: “USING ICT TO IMPROVE HEALTHCARE SERVICES PROVIDED TO THE POPULATION”	25
04.	SELECTION OF ICT INDICATORS IN THE NATIONAL HEALTH SYSTEM	29
	4.1. Basic data on the National Health System	30
	4.2. Infrastructure and Information Systems	33
	4.3. eHealth Services	35
	4.4. Financial information	39

Forewords

Moving towards the Networked Society is no longer an option. It is essential, and in Spain we are already at the forefront in many areas. The main reason for us to concentrate on developing and promoting the Information Society is to ensure that new technologies form part of our everyday lives and that citizens, companies and public administrations incorporate technological advances with ease.

We are on our way to achieving this goal and one of the main driving forces has been the Avanza Plan, implemented by the Spanish government in 2005 with an overall investment budget until 2010 of €5.770 million. Additionally, the extension of the Avanza Plan actions to 2012 (AvanzaDos Plan) has been announced.

We now are beginning to see important results as the figures obtained from the studies carried out by our National Telecommunications and Information Society Observatory show. In the last four years we have multiplied the number of broadband lines by almost four and their average speed by ten. Additionally, generalised use of the Internet is now a reality and by the end of 2008 there will be 24 million Spaniards surfing the net.

Over recent years, red.es has become an effective instrument for the promotion of the Networked Society. A good example of this is red.es' promotion of eHealth, an area in which, as a country, we can make many contributions towards interoperability between different health organisations.

The growing use of information technologies is one of the key elements behind the transformation of healthcare services over the last few years. Today, ICT are involved in both management and clinical processes, enabling the healthcare system to access more and better information about its own activities and results. Therefore, development of ICT is a strategic factor for all the health services and, consequently, for the whole society.

All the institutions need to make an effort to establish solid foundations for the exchange of healthcare information, initially within the autonomous regions, then extending it to the National Health System as a whole and, in the future, taking it to the European Union (EU) level.

It is in this context that the Healthcare Online programme within the Avanza Plan is being implemented. This Programme

is carried out jointly by the Ministry of Industry, Tourism and Trade through the public corporate entity red.es, the Ministry of Health and Consumer Affairs and the regional Departments of Health.

The aim of the Programme is to create the foundations for the exchange of healthcare information related to citizens and to take advantage of the potential offered by the information technologies to rationalise processes, improve the quality of services and to respond to the emerging needs of society.

In financial terms, the actions undertaken by red.es in 2006-2007 represented 21% of the ICT budget of the autonomous regions' Departments of Health for that same period, which shows red.es' commitment to measures and initiatives aimed at implementing new public digital services in the area of healthcare.

We are beginning to see the first results of what has already been done. With a view to improving the provision of healthcare services, more than 56,000 PCs have been installed in over 5,600 health care centres, benefiting 28.3 million people and 232,000 healthcare professionals. By the end of this year all regional Health Cards will be fully interoperable.

The deployment of technological infrastructure will also make it possible to provide the following services: interoperable health cards, electronic prescriptions, electronic health records and appointments via the Internet.

This report summarises the eHealth initiatives of the autonomous regions and the Ministry of Health and Consumer Affairs and gives a description of the Programme and the actions carried out by red.es. It reflects the preliminary work carried out by the various organisations involved and the boost in investment and projects generated by the Healthcare Online Programme.

Behind these figures there is a professional environment that is extremely receptive towards technology, highly qualified and strongly innovational, and in which R&D occupies a privileged place for the development of solutions that can become international benchmarks.

It is therefore not surprising that the technological sector is taking full advantage of the opportunities presented by programmes such as Healthcare Online for advanced industrial development. This enables us, as a country, to sustain a specialised industry that is already exporting specific ICT solutions applied to healthcare all over the world, an achievement of which we must all feel very proud.

Sebastián Muriel Herrero
General Director of red.es

Within its six main areas of action, the National Health System Quality Plan, presented by the Ministry of Health and Consumer Affairs in March 2006 includes the use of information technologies for improving the healthcare services provided to the population.

Over the last 15 years, the administrations integrated in the National Health System have been putting into practice important initiatives to improve accessibility to and the use of its services. The autonomous regions' Health Services have been prioritising lines of action in the area of information technologies, taking into account a series of criteria that go from opportunity and feasibility to budgetary commitments. Despite certain diversity in functional designs, all the autonomous regions coincide fully in three major lines of action.

The first of these is the creation of a reliable user identification system linked to the Individual Health Card. The second refers to the digitisation of patient's medical records, generally known as the Electronic Health Record. The third major line seeks to provide a system to support and associate all the processes necessary to efficiently provide patients with pharmaceuticals in a rational and functional manner, based on information and communication technologies.

The National Health System Quality Plan, therefore, embraces these common lines of action with a view to extending the benefits they provide within each region to the National Health System as a whole. In order to do this, it is incorporating the functional and technological elements necessary to make the regional systems interoperable throughout the whole of the country.

One of the strategies applied to develop these elements is the Healthcare Online programme launched within the framework of the Avanza Plan –a government initiative that seeks to generalise the use of technologies throughout Spanish society–.

The Avanza Plan, launched by the Spanish government aimed at achieving convergence with Europe in ICT use and implementation, constitutes a positive stimulus for undertaking actions aimed at achieving the aforementioned objectives.

The overall management of the Avanza Plan funds falls under the responsibility of the Ministry of Industry, Tourism and Trade, through its public corporate entity red.es. Its implementation in the public healthcare sector has been materialised

through a collaboration framework agreement signed between the Ministry of Industry, Tourism and Trade and the Ministry of Health and Consumer Affairs for the period 2006-2008 with a budget of €141 million. Within this framework, each autonomous region has been able to benefit from these funds through bilateral agreements signed with red.es and coordinated by the Ministry of Health and Consumer Affairs.

This has meant that strategic projects carried out by the Ministry of Health and Consumer Affairs and the regional Departments of Health, under the National Health System's Interterritorial Council agreements, have received a significant boost over the last three years. Consequently, the age of the Information Society now seems a lot closer in the world of healthcare - an age when professionals and citizens will have easy access to better and more structured information for their healthcare decisions.

Pablo Rivero Corte
General Director of the National Health System Quality Agency

Healthcare services are one of the public services that most affect citizen's lives, with constant social demand for improvement in their quality. The use of new technologies in this environment is key to improving management, optimising the use of resources, improving health expenditure control and therefore, offering society better services. The growing demand for improvement in effectiveness and efficiency is driving a global technological transformation process and stimulating the development of eHealth initiatives within healthcare systems. At the same time, the increase in staff and user mobility is beginning to make the availability and ubiquity

of health information a key objective for the improvement of healthcare processes.

The Spanish government has joined the autonomous regions' eHealth strategies through the Ministry of Health and Consumer Affairs and the Ministry of Industry, Tourism and Trade.

Within its six main areas of action, the National Health System Quality Plan, presented by the Ministry of Health and Consumer Affairs in March 2006, includes the use of information technologies (ICT) for improving the

- All autonomous regions have worked on computerising their health centres and services, and over the last 15 years they have gradually added new clinical applications, telemedicine solutions and healthcare management information systems to their healthcare systems. Today, hospital care at home, digital management of medical images and electronic prescriptions are a reality in the Spanish National Health System.

healthcare services provided to the population. On the other hand, the Healthcare Online programme within the Avanza Plan, launched by the Ministry of Industry, Tourism and Trade, reinforces the autonomous regions and the Ministry of Health and Consumer Affairs' strategies in the area of eHealth.

This document summarises the results reached by the Healthcare Online Programme at its halfway point in December 2007.

It provides a brief description of the implementation status of the Programme's services: identification of citizens and personnel, the electronic health record, the electronic prescription and Internet appointment system, applying a homogenous format to provide an overall view of the National Health System. The 17 autonomous

regions and the Ministry of Health and consumer Affairs, that conform the National Health Service, have provided all the relevant information. It also summarises the actions launched within the Programme by the Ministry of Health and Consumer Affairs and the Ministry of Industry, Tourism and Trade in the eHealth sector.

The report enables evaluation of the initiatives launched by the various public administrations in the area of healthcare ICT. It also enables identification of the tasks still pending in order to achieve the objective of making citizens' most relevant health information quickly and easily accessible, no matter where they go to receive healthcare services. Firstly in their respective autonomous regions, then throughout the whole of National Health System and finally at European Union level.

Avanza Plan Healthcare Online programme

The Avanza Plan was launched to respond to Spain's need to accelerate its integration in the Information Society and its objectives are to increase productivity, strengthen the industrial ICT sector, encourage R&D and develop modern interoperable public services, based on the effective use of ICT. The Plan is based on the European initiative "i2010: A European Information Society for growth and employment", presented by the European Commission on 31 May 2005, which identifies as main drivers for growth and employment as: knowledge, innovation and the construction of a fully integrated Information Society based on the

generalisation of ICT in public services, small and medium sized enterprises and homes.

One of the objectives of the Avanza Plan is to foster the use of ICT by the public administrations to adapt their services to the digital era. The "Digital Public Services" strategic axis includes actions in the areas of education, civil registry offices, electronic administration and healthcare in order to achieve quality public services that are more streamlined, accessible and efficient.

The reasons for incorporating measures for the

- Interoperability, both in Spain and in the European Community is a top level requirement. The challenge over the next years will be to integrate the various solutions and platforms implemented by the public administrations, so that citizens can access the new services regardless of where they are.
-
-
-
-
-

development of new digital healthcare services within the Avanza Plan include:

- The impact of healthcare services on the lives of citizens.
- The potential of the ICT industry in the area of health, a strategic sector for the construction of the Knowledge Society.
- The profile of the professional healthcare worker, who is familiar with and receptive to the use of technologies.

The measures of the Avanza Plan in the area of healthcare are part of the Healthcare Online programme, the aim of which is to support the implementation of projects such as the online doctor's appointment system, electronic prescription, electronic health record, and a health card that is interoperable throughout the entire National Health System.

The participants in this programme are the autonomous regions, through their Departments of Health, and the Institute of Health Management (INGESA), responsible for Healthcare Services in the autonomous cities of Ceuta and Melilla. The Central Government, promoter of the initiative, participates through the Ministry of Health and Consumers Affairs and Ministry of Industry, Tourism and Trade, which has assigned the management of the Programme to the public corporate entity red.es.

2.1. Objectives and Actions

The Healthcare Online Programme offers the health authorities a further instrument to fulfil their healthcare objectives, through the use of new technologies and joins forces with the autonomous regions and the Ministry of Health and Consumer Affairs in this sector in their quest to:

- **Develop online healthcare services** that improve the quality of citizens' lives and improve the efficiency of the health system.
- **Complete the implementation of an interoperable health card system** that will unequivocally identify the user throughout the whole National Health System.
- **Make a central infrastructure available to enable the exchange of healthcare data** between autonomous regions.
- **Implement electronic prescriptions** to reduce doctors' paperwork and unnecessary visits to the doctor, particularly the chronically ill, and facilitate their access to pharmaceuticals.
- **Enable electronic access to clinical data and progressively implement the electronic health record.**
- **Exchange digitised administrative and clinical information** between the various regional health services in a streamlined and secure manner.

- The Healthcare Online programme has an allotted budget of €252 million, to which the Ministry of Industry, Tourism and Trade contributes €140 million, the autonomous regions contribute €111 million and the Ministry of Health and Consumer Affairs contributes €1 million.

The actions were initiated in April 2006. In December 2007, red.es reached the halfway point in the implementation of the Programme, with €75.12 million invested in projects and follow-up actions, which is equivalent to 21% of the total ICT investment for healthcare budgeted by the autonomous regions for the period 2006-2007.

The initiatives undertaken by red.es within the Programme include the supply and installation of infrastructure, reinforcement of the data processing centres, enlargement of the National Health System's central node, located in the Ministry of Health and Consumer Affairs, and development and implementation of the electronic prescription in Cantabria and Murcia Health Services, with the direct collaboration of the Departments of Health of both autonomous regions.

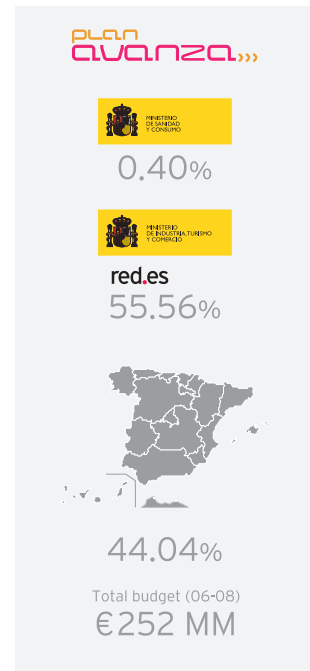
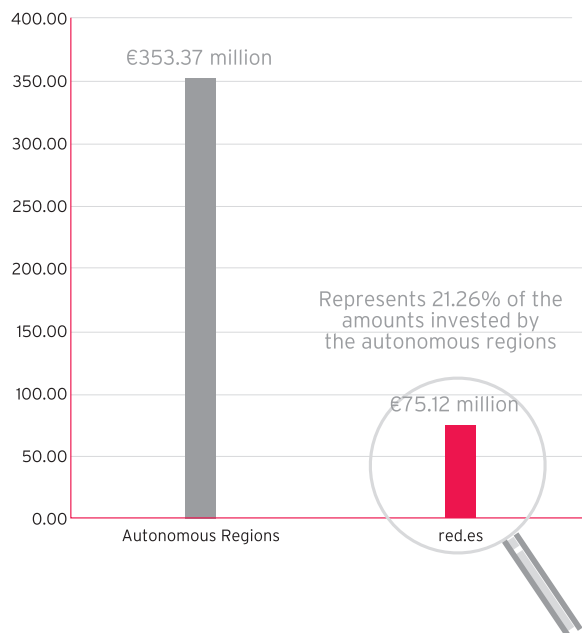


Figure 1. Total ICT healthcare investment by autonomous regions and red.es for 2006-2007 (€ million)¹



Source: red.es. From data supplied by the regional Departments of Health.

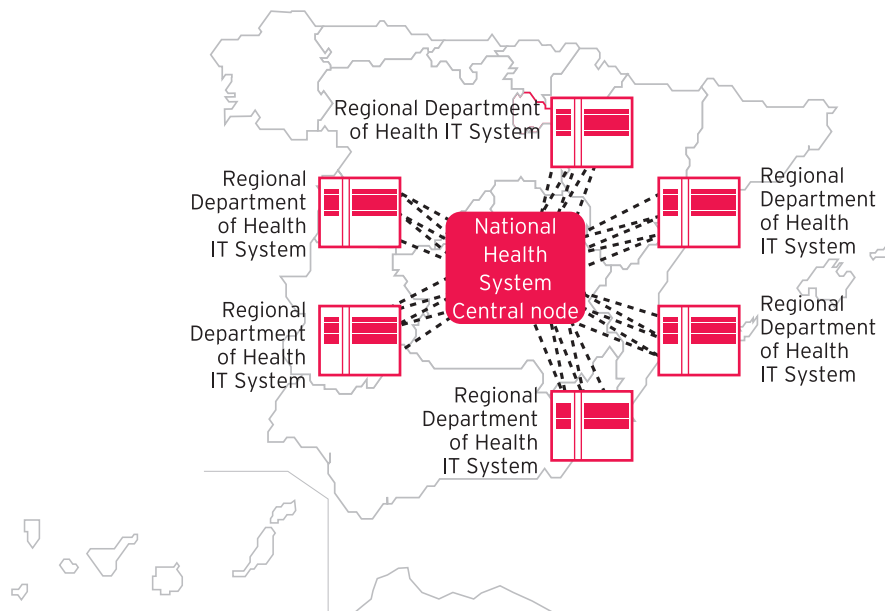
¹ For Catalonia, only information relating to the Catalanian Institute of Health has been included.

The investment by red.es through the Healthcare Online programme represents more than 21% of the ICT budget of the Departments of Health of the autonomous regions for the period 2006-2007

The Ministry of Industry, Tourism and Trade, through red.es, acts at National Health System level in coordination with the Ministry of Health and Consumer Affairs, reinforcing the central node in order to guarantee the exchange of data associated to the new online services and, at regional level, complementing the eHealth strategies of the autonomous region's Health Services.

The projects and specific actions are established taking into account the existing situation in the different autonomous regions, their strategies and established plans. These actions have to be carried out within the National Health System's interoperability model, which enables interconnection of the different Health Services in the autonomous regions, through the Healthcare Intranet operated by the Ministry of Health and Consumer Affairs.

Figure 2. Schema of the National Health System central node: National Health System communication platform enabling health information exchange between autonomous regions



Source: red.es.

Healthcare Online involves the performance of actions by the signatories of the Framework Agreement and Bilateral Agreements that constitute the Programme's legal basis. As the Programme's implementation has progressed, a natural evolution in the type of projects undertaken by red.es has been observed. Since the start, when the majority of the actions were aimed at consolidating the basic infrastructure of the health care centres, the projects undertaken have become more complex towards the midpoint of the Programme. These new actions include: reinforcement of the data processing centres, projects to integrate systems, services and/or processes, security, infrastructure and

networks, storage, support for the exchange of medical images, telemedicine projects, project co-ordination and project management.

The ongoing actions are listed below in table 3, indicating the agents directly involved in defining and carrying out of the projects.

Figure 3. Projects undertaken by red.es within the framework of the Healthcare Online programme and the agents participating in their definition and implementation

	Red.es Autonomous Regions and INGESA	Red.es Ministry of Health and Consumer Affairs
Expansion and renewal of computer equipment (PCs and printers) in healthcare centres and central services.	✓	
Supply of high resolution monitors for viewing diagnostic images.	✓	
Expansion and reinforcement of data processing centres (storage and servers).	✓	
Electronic prescriptions (Murcia and Cantabria).	✓	
Equipment for telemedicine projects.	✓	
Enlargement of the National Health System's central node.		✓
Backup centre for the National Health System's central node.		✓
Information Security Management System (ISMS) and its subsequent certification under the ISO 27001:2005 standard.		✓
Services to complete health card synchronisation.		✓

Source: red.es.

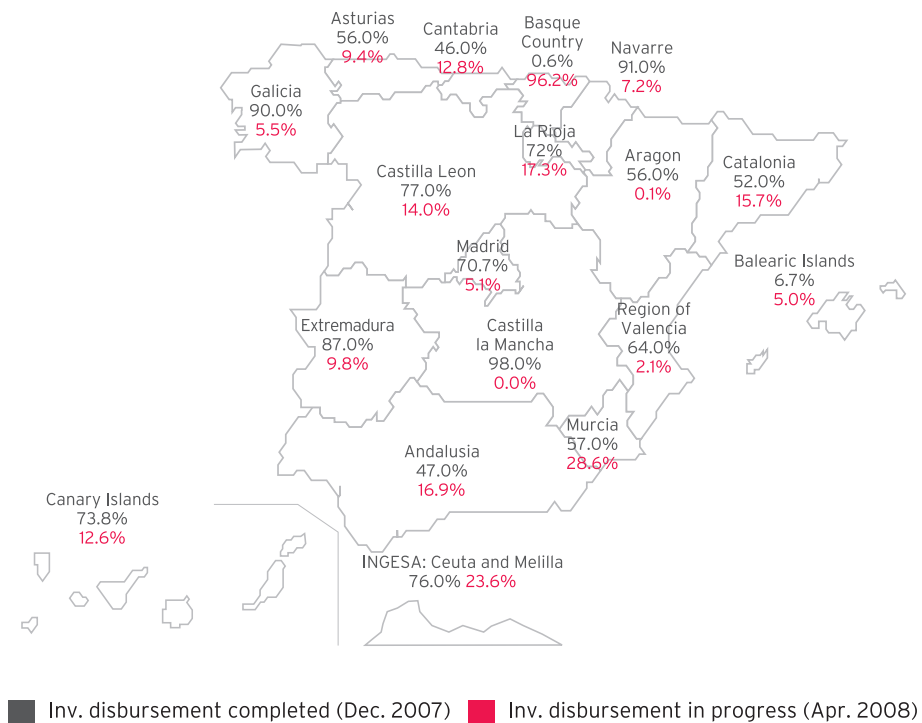
2.2. Results

In December 2007, the investment made by the Healthcare Online programme on projects undertaken in autonomous regions was equivalent to 61% of the total amount committed by red.es in direct investment in the autonomous regions (€112 million). Figure 4 shows the level of disbursed investment for completed projects per autonomous region in December 2007 together with the percentage of investment associated to new projects in progress in April 2008. The level of investment disbursed

for completed projects in each autonomous region is linked to the date of signature of the agreements and the nature of the projects.

The investment made has enabled the supply and installation of more than **76,000 ICT devices**, as well as increasing storage capacity in various data processing centres.

Figure 4. Percentage of investment disbursed for completed projects by red.es in autonomous regions at December 2007 and investment on projects in progress at April 2008



Source: red.es.

Figure 5. Details of the ICT equipment supplied and installed by red.es




	PCs ²	Printers	High resolution monitors	Servers	TOTAL centres
Primary care Health Centres and Doctors' Surgeries	6,541	9,228	3	2	4,552
Hospitals and Specialist Centres	30,121	9,624	221	297	420
Other healthcare centres	5,883	1,540	7	21	154
Central Services	5,691	1,735	15	1,410	124

Source: red.es.

One of the underlying objectives of the Programme, as has already been mentioned, is to bring the benefits of information technologies in the area of healthcare services to citizens. A series of indicators have been prepared in order to give an idea of the penetration of the infrastructure projects undertaken and describe their results, not only in terms of provision of technology but also in terms of improvements that affect access to

healthcare services, the structured information available, and the security and the continuity of healthcare services. These indicators reflect the impact that the provision of infrastructure and associated services has had in terms of potential improvement for the Health System's main agents: the citizens and healthcare personnel.

Figure 6. Indicators of the impact of the *Healthcare Online* programme

Indicator	Figures at Dec. 2007
Installed equipment (PCs, printers, servers, monitors)	76,742
Beneficiary healthcare centres	5,125
 Healthcare professionals working in these centres	182,081
 Administrative personnel working in these centres	48,377
 Citizens registered at these centres	28,172,858
Central services that have received equipment (Administrations, Department offices, Provincial offices, etc.)	125

Source: red.es. From data supplied by regional Departments of Health.

² Including personal computers, laptops, tablet PCs and thin clients.

A good example of red.es' evolution towards more complex initiatives is the project for the implementation of an electronic prescription solution carried out in collaboration with the Cantabria and Murcia Departments of Health.

Electronic prescription is an information system that enables automation of the identification, prescription, control and pharmaceutical dispensing processes (clinical cycle) as well as the administrative process for invoicing the prescriptions dispensed (administrative cycle).

It constitutes another step forward in the modernisation of the regional Health Services that incorporates benefits for citizens, particularly the chronically ill and their carers, reduces the pressure on healthcare personnel in the care provided by reducing the paperwork part of consultations, and gives greater streamlining and transparency to the administrative process both for the public administrations and for the pharmacies.

Figure 7. Other actions undertaken by red.es

	Other actions in the autonomous regions	December 2007
Electronic Prescription	Analysis of the initial situation in Murcia and Cantabria has been completed.	
Storage systems	176 Tbytes of storage.	
Telemedicine equipment	Special equipment for starting up telemedicine services for radiology and dermatology (Ceuta and Melilla).	

Source: red.es.

Lastly, a summary is presented of the Healthcare Online programme contributions from the perspective of the collaboration between the public administrations and in

relation to the construction of a set of interoperable services within the entire National Health System.

Figure 8. Investment and the results of projects carried out by red.es in the National Health System's central node

	Actions on the National Health System's central node		
	Total Investment	Completed investment 31-12-2007	Degree of progress 31-12-2007
Enlargement of the central node and creation of a backup centre	€13.3 million	€4.4 million	Hardware and software infrastructure installed. Completed backup centre infrastructure rollout.
Security project	€747,000.0		Analysis to comply with the Data Protection Law has been completed. Recommendations plan issued. Overall security audit initiated.

Source: red.es.

2.3. Contributions of the Programme

The Healthcare Online programme is enabling:

- Consolidation of the commitment by the Ministry of Industry, Tourism and Trade to the development of public digital services and to ICT for the healthcare sector, with an additional investment of €140 million.
- Provision of investment, technical advice and implementation capacity to the autonomous regions by the central government.
- Development of projects to meet the specific needs of each autonomous region and exchange of best practices within a broader National Health System agenda.
- Validation of a new management model in the National Health System in which red.es has assumed the role of technological collaborator of the Departments of Health and the Ministry of Health and Consumer Affairs in the planning and implementation of ICT projects.
- Awareness raising regarding deadlines and key elements for carrying out information technology projects within the National Health System.

This section sets out an assessment of the 2006-2008 activities regarding the main services planned for health centres within the Healthcare Online programme, taking

into account the actions undertaken by the main agents. In this period, and particularly beforehand, the work carried out by the autonomous regions makes it possible to see the significant advances made in the areas of the Programme's main action lines, although there is still much to be done to complete the integration of the healthcare information systems in the National Health System as a whole.

The first software applications in the National Health System were developed ad hoc more than a decade ago, with very specific aims and local application. Today, we have complex information systems capable of communicating information of different types through distributed data networks. The autonomous regions' Health Services have applied various strategies to incorporate the information technologies, with the consequent variation in the degree of development. However, there are common objectives and shared projects, such as: a user identification system, electronic health records, development of systems supporting and interrelating the necessary processes for providing pharmaceuticals (prescription, verification and dispensing), initiatives to streamline the patient appointment system, devices for remote diagnosis and treatment, and of course the financial-administration management services. Currently, the integration of the various healthcare information systems is on the agendas of all autonomous regions' Health Services, as well as data exchange within the entire National Health System as a whole, and at a European level in the future.

- In short, the *Healthcare Online* programme has promoted eHealth, it provides support to autonomous regions to accelerate the integration of Information Systems in their respective areas and to the Ministry of Health and Consumer Affairs in the creation of a basis for the interoperability of the new services in the National Health System.

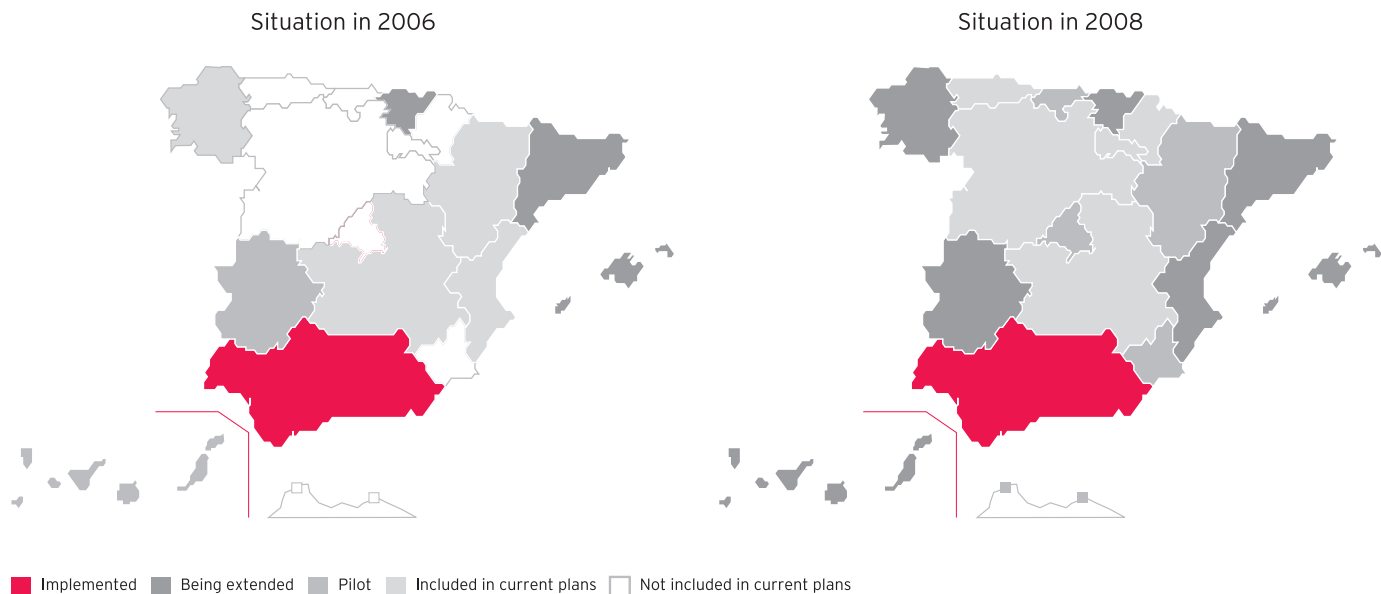
Electronic prescription in primary health centres

The fundamental objective of the electronic prescription is to free doctors from the administrative task of filling out prescriptions in those cases in which treatment continuity does not require review. Applying this philosophy means that a prescription is completed once, in a single action, for all the medicines that the doctor deems necessary and in the quantity necessary to comply with the indicated treatment guidelines and duration. The electronic prescription is very useful for the chronically ill and their carers, as well as to achieve rational use of medicines, improve treatment compliance, prevent the sale of pharmaceutical products without a prescription, prevent fraud and, in general, improve information on consumption and reinforce the role of the pharmacists as healthcare agents.

Following the implementation of an electronic prescription system in a given Health Service, within the medium term citizens will be able to use this service in the autonomous region's pharmacies. In the long term, as the service extends throughout the different regions, this option will become available throughout the National Health System as a whole, regardless of where the prescription was issued.

In 2006, the electronic prescription had only been implemented in the health centres of Andalusia; the Balearic Islands, Catalonia, and the Basque Country had taken the first steps towards the service and the Canary Islands and Extremadura both had a pilot project. At the start of 2008, all remaining autonomous regions had begun, to a greater or lesser degree, to take the necessary steps for the implementation of the service. Figure 9.

Figure 9. Implementation status of the electronic prescription in primary care health centres 2006/2008³



Source: red.es, from information provided by the regional Departments of Health.

³ In Madrid, the electronic prescription pilot scheme has already concluded and the solution rollout in the region is planned for 2008.

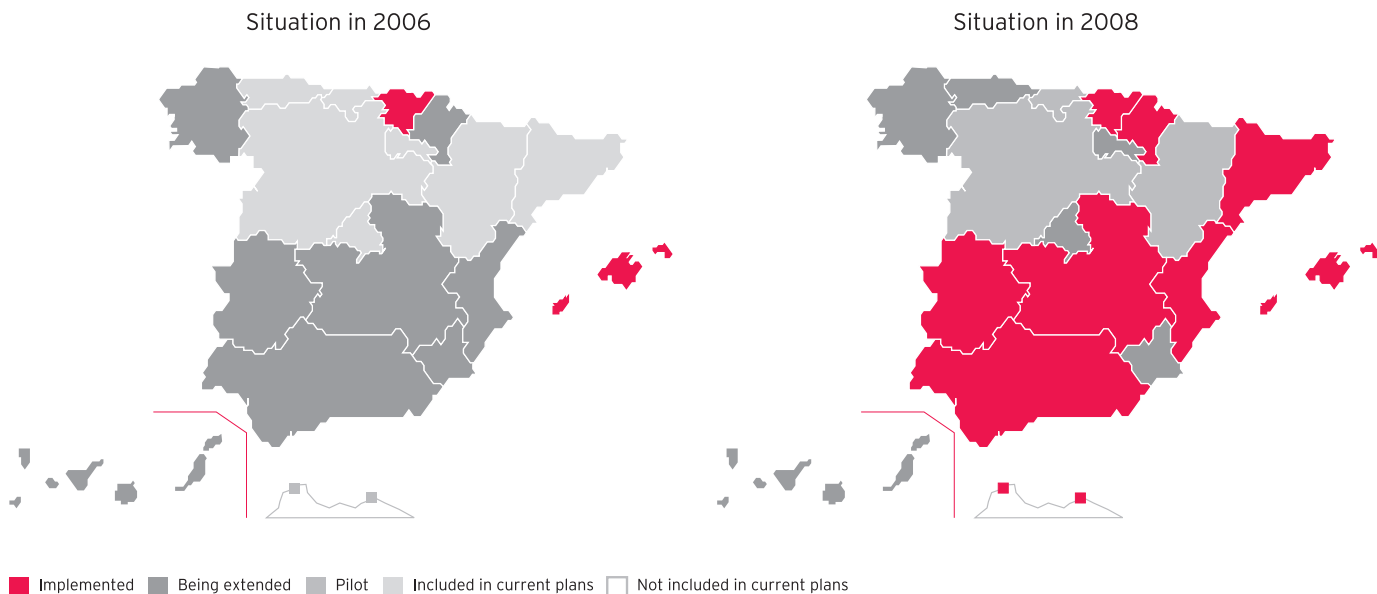
Electronic health record in primary care health centres

Autonomous regions have been carrying out projects for more than a decade to develop the electronic health record. The aim is to establish a single health care record that includes the information on the different contacts between the citizen and the healthcare system (primary and specialized with specialists, hospitalisation, etc.), as well as diagnostic tests (laboratory results, medical images, etc.), which is accessible from any of the region's health centres. The degree of maturity and development of these types of projects varies.

On the other hand, the Ministry of Health and Consumer Affairs included in its Quality Plan approved in 2006 an Electronic Record project for the National Health System.

As regards implementation of the integrated electronic health record in the autonomous regions, in 2006, only the Balearic Islands and the Basque Country had implemented this service, though another 8 regions were in the process of doing so. In 2008, Catalonia, Navarre, Castilla-La Mancha, Ceuta and Melilla, Andalusia, Extremadura and the Region of Valencia had joined the group of regions that had implemented the service in primary care health centres and another 6 regions were in the process of doing so. The 3 remaining regions are finalising the project development that will enable them to integrate the electronic health record in their health centres. Figure 10.

Figure 10. Implementation status of the electronic health record for integrated primary care in health centres 2006/2008



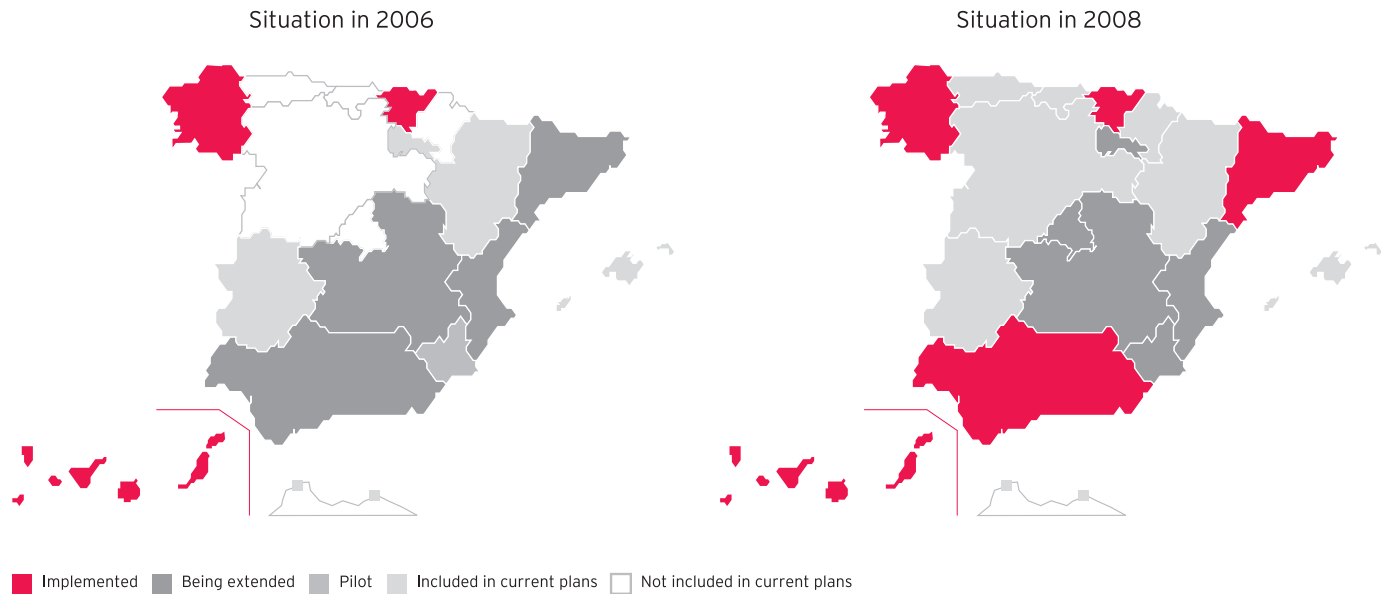
Source: red.es, from information provided by the Health Services and regional Departments of Health.

Online appointment system for primary health centres via the Internet

In 2006, the health centres of the Canary Islands, Galicia and the Basque Country had implemented the Internet appointment system and another 4 regions were about to do so; 1 had a pilot scheme and 4 more were planning to implement it, as were Ceuta and Melilla, whilst the other 5 still had no plans to develop this service.

In 2008, Catalonia and Andalusia had joined the group of regions with the service implemented, another 5 regions are in the process, and the remainder are planning to begin implementation in their health centres in the medium term. Figure 11.

Figure 11. Implementation status of Internet appointments for primary care health centres 2006/2008



Source: red.es, from information provided by the Health Services and regional Departments of Health.

Strategy of the Ministry of Health and Consumer Affairs. National Health System Quality Plan: “Using ICT to improve healthcare services provided to the population”

Within its six main areas of action, the National Health System Quality Plan, presented by the Ministry of Health and Consumer Affairs in March 2006 includes the use of information technologies (ICT) for improving the healthcare services provided to the population. One of the strategies for the development of this area is the Healthcare Online programme, launched within the framework of the Avanza Plan –a government initiative that seeks to generalise the use of technologies throughout Spanish society–.

Over the last 15 years, the administrations integrated in the National Health System have been putting into practice important initiatives to improve accessibility to and the use of its services. Regional Health Services have prioritised different lines of action in the field of information technology. Despite certain diversity in functional designs, all the autonomous regions coincide fully in four major lines of action.

- A reliable system for user identification (Individual Health Card).

- The development of the electronic health record.
- A system to support and interrelate all the processes necessary for providing pharmaceuticals to patients and users (prescription, verification, dispensing).
- Mechanisms to aid and streamline making appointments with primary care doctors and specialists, and devices for remote diagnosis and treatment, avoiding the need to travel (telemedicine).

The National Health System Quality Plan, therefore, embraces these common lines of action with a view to extending the benefits they provide within each region to the National Health System as a whole.

The strategy covers areas that go from the most basic levels of healthcare to structures and devices of major complexity. The Ministry of Health and Consumer Affairs has directed its actions in two areas: firstly, to co-operate with the autonomous regions in supporting their initiatives for the development and implementation of

- At international level, and within the European eHealth initiative, Spain is participating with 12 other Member States in two Large Scale Pilots for clinical information exchange (*ePrescription and patient summary*). The Ministry of Health and Consumer Affairs, together with three autonomous regions (Andalusia, Castilla-La Mancha and Catalonia) are participating in the project.

the four major lines described above and secondly, to promote and fine-tune those elements necessary for these systems to interoperate at national and international level. The Avanza Plan funds, committed in the Healthcare Online programme and managed by the public entity red.es, have provided significant support for the progress of these actions over 2006 and 2007.

The actions undertaken and the advances achieved up to December 2007 are detailed below:

- In December 2005, 11 autonomous regions, Ceuta and Melilla had been incorporated in the database of the population covered by the National Health System. With the implementation of the Quality Plan in 2006 and 2007, Navarre and Galicia were integrated and preparatory work had reached an advanced stage for the imminent connection of the databases of Andalusia and Valencia, and in the longer term, those of Catalonia and the Basque Country.
- Great progress has been made within the area of the electronic health record project in the last two years:
 - In 2007, agreement was reached on the professional proposals regarding the sets of data to be shared within the National Health System (except Laboratory Tests Reports) and on the analysis of

requirements of the National Health System's medical record system to enable data exchange.

- The data model was studied and approved by the Departments of Health of all the autonomous regions and by the Information Systems Subcommittee and, on 10 December 2007, the National Health System's Interterritorial Council gave its approval for the start-up of a pilot scheme for this exchange system. During the last quarter of 2007, the group of autonomous regions that were to participate in the Medical Record Pilot Scheme (*Grupo de Comunidades Autónomas participantes en el Piloto de Historia Clínica, GCPHC*) was set up. The pilot scheme was planned to be carried out during 2008.
- A study for the purpose of reaching an agreement on standards in the National Health System has been initiated. For this purpose, the Technological Standards and Technical Requirements Group (*Grupo de Estándares Tecnológicos y Requerimientos Técnicos, GERT*) was set up at the end of 2007, with representatives of all autonomous regions' Health Services to reach an agreement on the adoption of a standards policy in the National Health System as a whole.

- During the last quarter of 2007, the Assessment Group for Semantic Interoperability of Medical Records (*Grupo Asesor de Interoperabilidad Semántica de la Historia Clínica, GAISHC*) initiated its activities. Its mission is to draw up reports enabling the National Health System to take decisions and adopt agreements to resolve semantic interoperability issues in the medical record systems.

Selection of ICT indicators in the National Health System

In this section, an aggregated view of the implementation status and use of ICT in the National Health System is shown. Depending on the availability of information, some basic indicators have been selected that enable the identification of strengths in the area of eHealth as well as areas for improvement.

The senior officials of the regional Departments of Health and also of INGESA, which provided data for the autonomous cities of Ceuta and Melilla, collaborated actively in the data collection process.

The information is grouped in four major blocks:

- **Basic data of the National Health System:** Information about system resources and the citizens with public health coverage.
- **Infrastructure and systems:** Data on the existing equipment and type of connectivity in the healthcare centres, as well as the degree of implementation of some of the main healthcare information systems, both for primary and specialised care.
- **Services:** Information about the volume of activity recorded by the healthcare information systems, the implementation of services, such as computerised prescriptions, electronic prescriptions and online appointments, as well as the volume of healthcare information associated to citizens and accessible from any centre. Considerations regarding the impact of these services in terms of numbers of citizens benefited are also included.
- **Financial data:** Financial resources committed by the regional Departments of Health for financing healthcare information technology projects, and details of the contribution of red.es within the framework of the Healthcare Online programme.

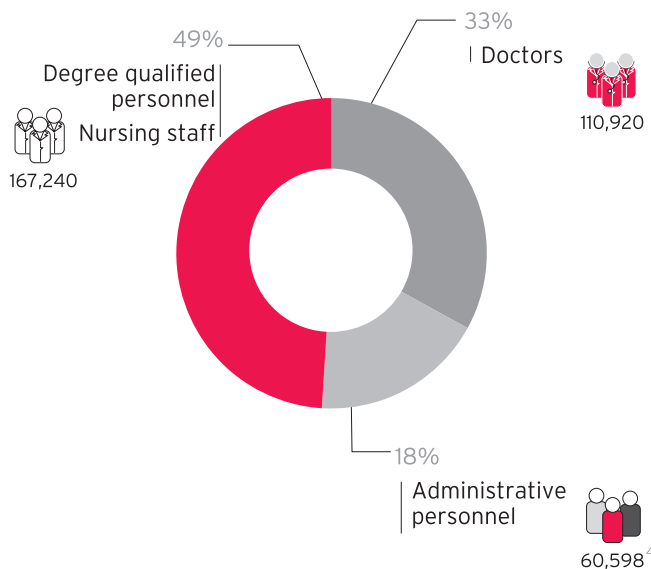
• The World Health Organisation defines the concept of eHealth as *“the use, in the health sector, of digital information, transmitted, stored or obtained electronically for the support of health care both at a local and remote level.”*

4.1. Basic data on the National Health System

According to the information obtained in the context of the Healthcare Online programme, the National Health System has more than 278,000 healthcare professionals, doctors and nursing staff, and more than 60,000 administrative staff working in the health centres. Figure 12.

Additionally, there are around 1,700 contracted staff belonging to the regional Health Services that carry out duties associated with the implementation, maintenance and management of healthcare ICT. The number of these staff varies between 6 and 264, depending on the Health Service. This data has not been included in the figure because the work of these professionals is generally complemented with external staff who help internal

Figure 12. Distribution of staff working in healthcare centres. National Health System 2007



Source: red.es. From data supplied by the National Health System's Healthcare Services.

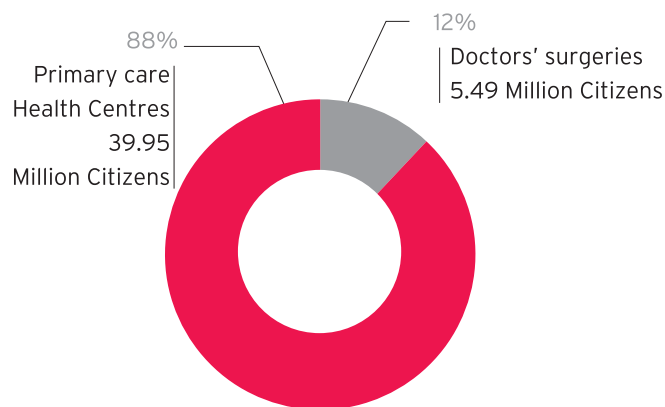
⁴ Administrative staff working in healthcare centres. No information available on: - Region of Valencia: Own ICT staff. Region of Valencia and Basque Country: Administrative staff working in healthcare centres.

resources, both in carrying out turnkey projects and in maintenance and support tasks for the ICT services and infrastructure.

Primary care, that is, consultation with the General Practitioners (GPs) and paediatricians, is provided in the National Health System in primary care health centres and doctors' surgeries. About 88% of the Spanish population receive healthcare in the former. Doctors' surgeries are commonly found in the rural areas of certain regions such as Aragon, Andalusia, Castilla-La Mancha and especially in Castilla y Leon, although the population attended does not exceed 1% of the population living in these autonomous regions.

The percentage of the population registered at each type of centre can be seen in Figure 13. In total, 88% of the

Figure 13. Population registered with primary care health centres and doctors' surgeries. National Health System 2007

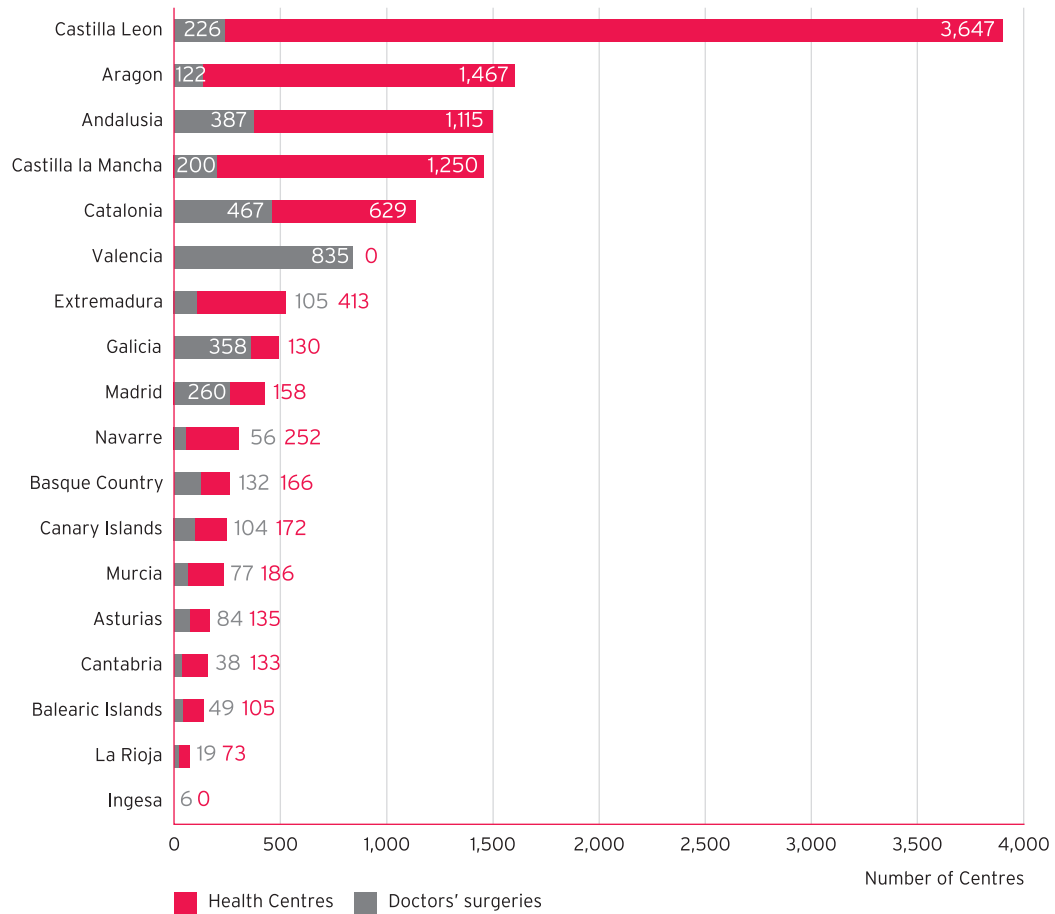


Source: red.es. From data supplied by the National Health System's Healthcare Services.

population receives primary care in the health centres compared with 12% in doctors' surgeries. Figure 14 shows

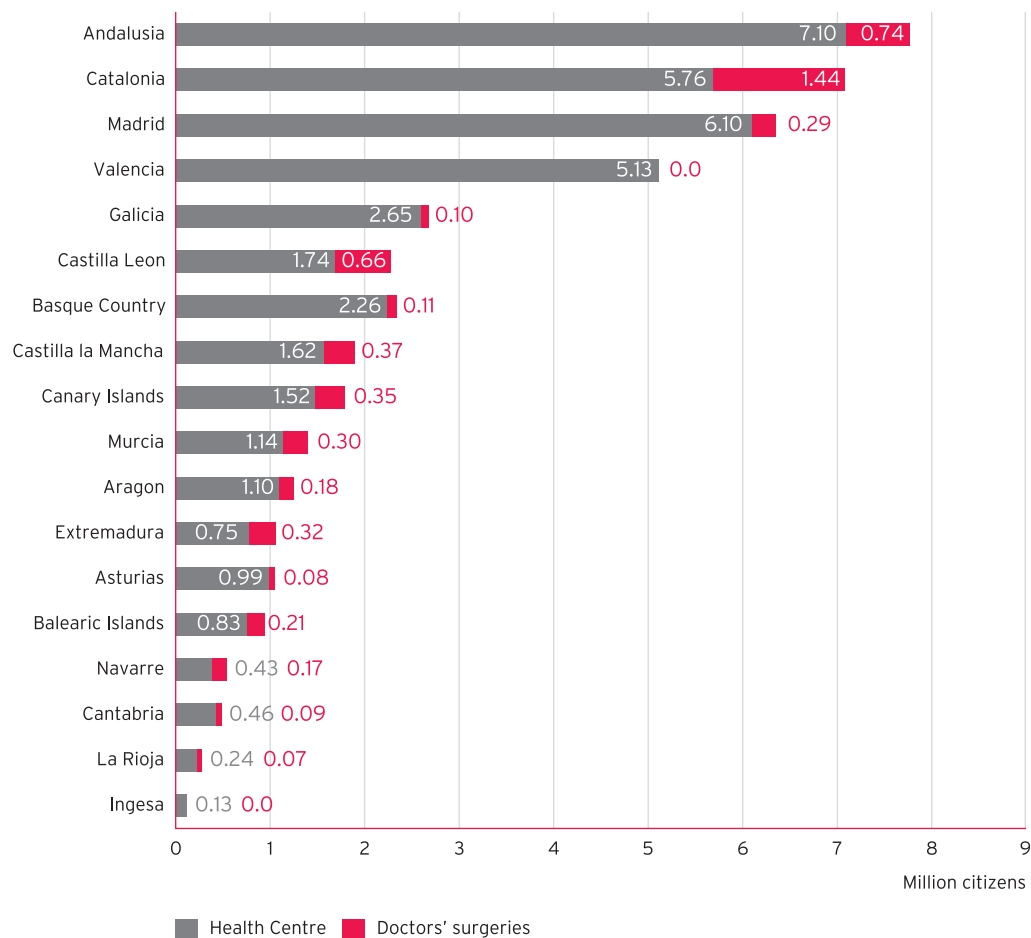
the regional distribution of primary care centres by type: health centres or doctors' surgeries.

Figure 14. Primary care centres (health centres and doctors' surgeries). National Health System 2007



Source: red.es. From data supplied by the National Health System's Healthcare Services.

Figure 15. Population with a health card registered with primary care centres (health centres and doctors' surgeries). 2007



Source: red.es. From data supplied by the National Health System's Healthcare Services.

The graph in Figure 15 reflects the importance of the health centres as the core element of the healthcare services in the area of primary care in the different

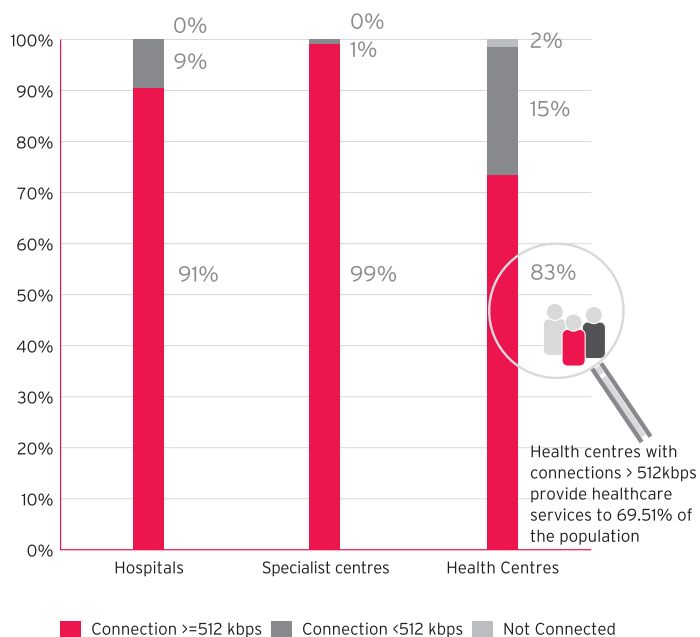
autonomous regions. For this reason, the indicators of primary care reported in this document generally refer to this type of centre.

4.2. Infrastructure and Information Systems

Almost all the specialised healthcare centres and primary care health centres are connected to corporate networks⁵ over broadband at speeds higher than 512 kbps. Around 43% of the doctors' surgeries are connected to the corporate network of the corresponding regional Health Service and of these, 79% have connections with speeds lower than 512 kbps.

Hospitals and specialised centres mostly have connections to the corporate network with broadband speeds higher than 512 kbps. All of this is shown in Figure 16.

Figure 16. Healthcare centres by network connection type. National Health System 2007

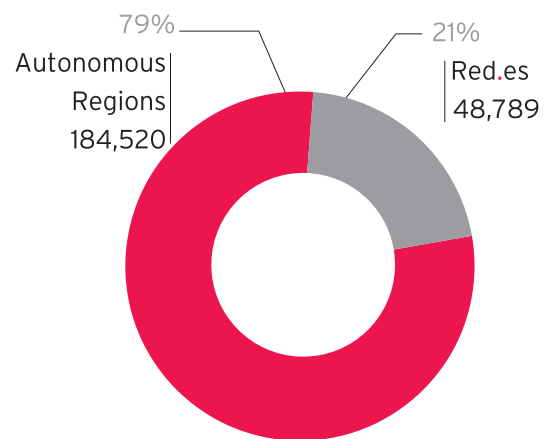


Source: red.es. From data supplied by the National Health System's Healthcare Services.

Figure 17 shows the stock of personal computers installed in all National Health System health centres; 80% of the equipment is for use by healthcare personnel and 20% for administration and centre management.

In the figure, the repercussion of the Healthcare Online programme in terms of computerisation of health centres can also be appreciated. The equipment supplied by red.es up to December 2007 represents 21% of the total installed stock at this date.

Figure 17. Stock of PCs in healthcare centres. National Health System 2007⁶



More than 200,000 PCs, 80% for clinical use and 20% for administrative use in 14,007 centres.
1.37 clinical professional staff (doctors and qualified nurses) per PC

Source: red.es. From data supplied by the National Health System's Healthcare Services.

⁵ Sometimes this communication network is for exclusive use by the Health Service or the Department of Health and in other cases, the network provides services to other departments in the regional administration.

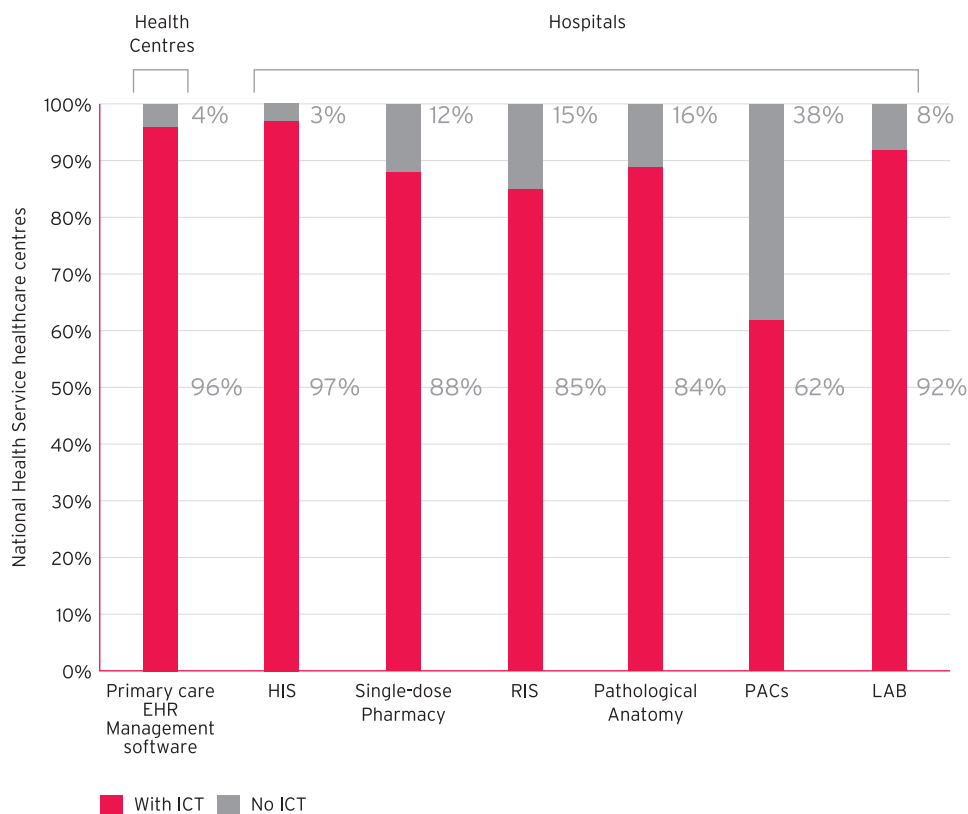
⁶ Not included in the figure because of lack of availability of the information for: Andalusia: PCs for clinical use in doctors' surgeries and for administrative use in hospitals and health centres. La Rioja: PCs in doctors' surgeries and in specialist centres. For the calculation of the ratio of PCs, the data on doctors and qualified nurses for 2006 were extracted from the following documents: Estadística de Establecimientos Sanitarios con Régimen de Internado (Statistics of Healthcare Establishments with Internship Regime) and Sistema de Información de Atención Primaria, SIAP: Fase I (Information Systems for Primary Care: Phase I). Both published on www.msc.es

To conclude the analysis of the level of computerisation in healthcare centres, the degree of implementation of the main healthcare information systems, both in health centres and in hospitals has been examined. Figure 18.

It is interesting to note that 96% of healthcare centres have at least one computer solution installed to facilitate clinical-healthcare management by GPs and paediatricians. This type of equipment enables electronic recording of primary care medical records and management of the medicine prescriptions.

As regards hospitals, 97% have a hospital information system (HIS) enabling management of admissions, beds, schedules, external consultancy appointments, medical record files, emergencies and operating theatres. Likewise, around 85% of National Health System hospitals have management systems for radiology, pathology and single-dose pharmacy. Systems for storage of digital images (PACS) are available in more than 60% of hospitals and more than 90% have laboratory information systems.

Figure 18. Implementation of the main healthcare information systems. National Health System 2007⁷



Source: red.es. From data supplied by the National Health System's Healthcare Services.

⁷ The information from Andalusia is not represented in this figure: Hospitals with APA, single-dose Pharmacy, LAB, PACS and RIS. In Catalonia, there are a total of 61 hospitals, but only the information of the 8 belonging to Catalanian Health Institute is shown.

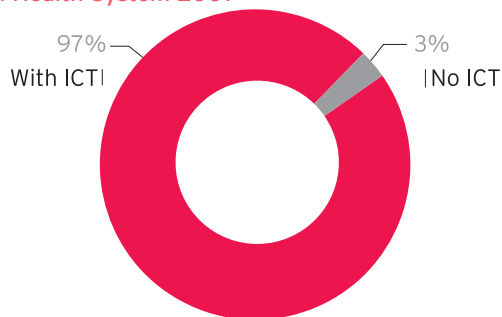
4.3. eHealth Services

The analysis of the implementation and use of eHealth services, such as appointments via the Internet and electronic prescription of medicines was performed using two types of data:

- The number of medical records generated by the information systems deployed in the healthcare centres.
- The number of citizens attended in healthcare centres where a specific information system is available, as well as the use made of services such as appointment via the Internet or electronic prescriptions.

The following figures show four specific examples of the degree of healthcare activity managed by systems based on information technologies. Figure 19 shows the percentage of consultations made in 2007 in health centres with the aid of a GP information system. The three other figures measure the amount of hospital activity managed through an information system in the areas of external consultations (Figure 21), laboratory tests (Figure 20) and emergencies (Figure 22).

Figure 19. Consultations in primary care health centres. National Health System 2007⁸



Source: red.es. From data supplied by the regional Departments of Health.

Figure 20. Hospital activity in laboratory tests. National Health System 2007⁹

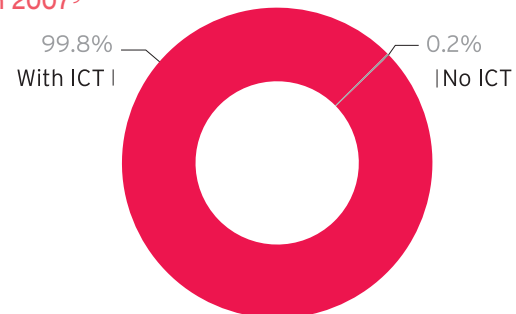
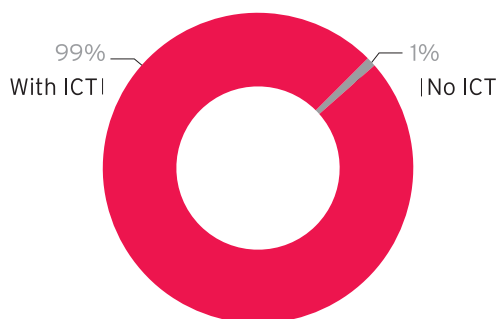
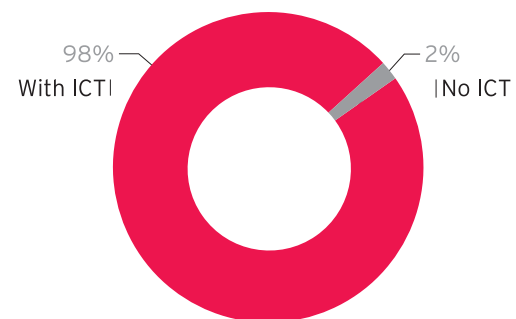


Figure 21. Patient management system: External consultancies. National Health System 2007¹⁰



Source: red.es. From data supplied by the regional Departments of Health.

Figure 22. Patient management system: Hospital emergencies. National Health System 2007¹¹



⁸ Information from the Region of Valencia and Andalusia has not been included in the figure.

⁹ Information from Andalusia, Region of Valencia, La Rioja, Galicia and Cantabria has not been included in the figure.

¹⁰ Information from Andalusia, Region of Valencia and La Rioja has not been included in the figure.

¹¹ Information from Andalusia, Region of Valencia and La Rioja has not been included in the figure.

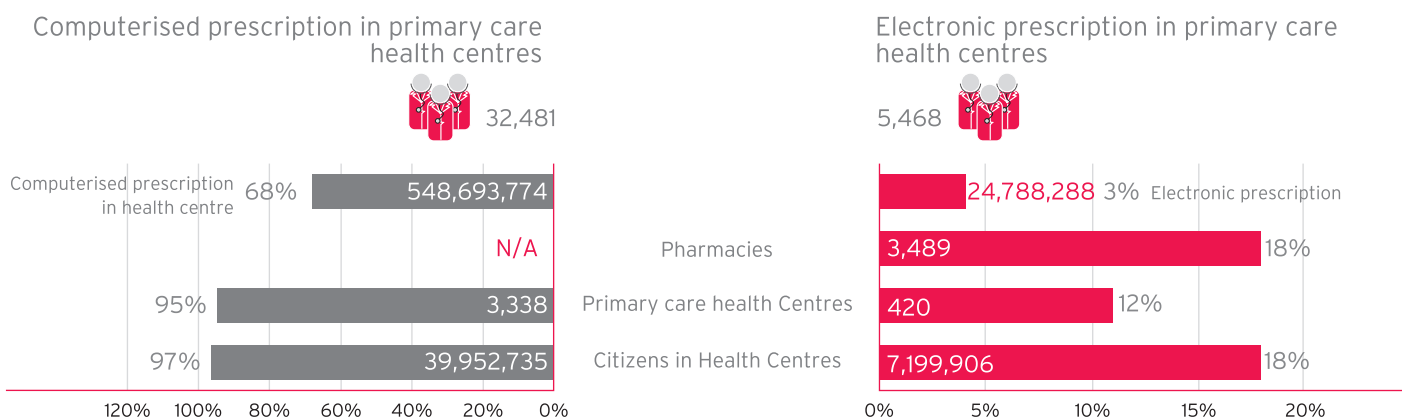
Following this, Figure 23 shows the activity associated with prescription processing in the National Health System and its impact on citizens and staff, compared with computerised prescriptions. As can be observed, the computerised prescription has been heavily implemented in National Health System health centres.

- Around 95% of primary care health centres have some type of solution enabling the creation and management of prescriptions by computerised means.
- Close to 40 million citizens receive healthcare services in primary care health centres where consultation rooms have a computer solution to manage medicines' prescription.
- Some 68% of the prescriptions issued by GPs and paediatricians in 2007 were issued using prescription software.

As regards the electronic prescription systems, which, in addition to computerised prescription, enables the electronic dispensing of medicines as well as automation of invoicing, around 5,500 paediatricians and GPs now have this type of system and 7 million citizens are cared for in primary care health centres offering this type of service.

It is important to note the impact of the Andalusian Health Service's Receta XXI project on the data associated with electronic prescriptions. In fact, 86% of the National Health System health centres and 95% of the pharmacies with an electronic prescription system are in Andalusia; 90% of the doctors who have the system are personnel belonging to the Andalusian Health Service and 93% of the citizens benefiting from these systems receive healthcare services in the public health centres of Andalusia. Similarly, 96% of all electronic dispensing has been prescribed in health centres belonging to the Andalusian Health Service.

Figure 23. Profile of computerised prescriptions and electronic prescriptions. National Health System 2007¹²



Source: red.es. From data supplied by the regional Departments of Health.

¹² Information on doctors working in primary care health centres with automated prescription processes in Cantabria has not been included in the figure.

Figures 24 and 25 focus on the analysis of the population registered in healthcare centres that have specific information systems through which some part of the clinical activity is managed.

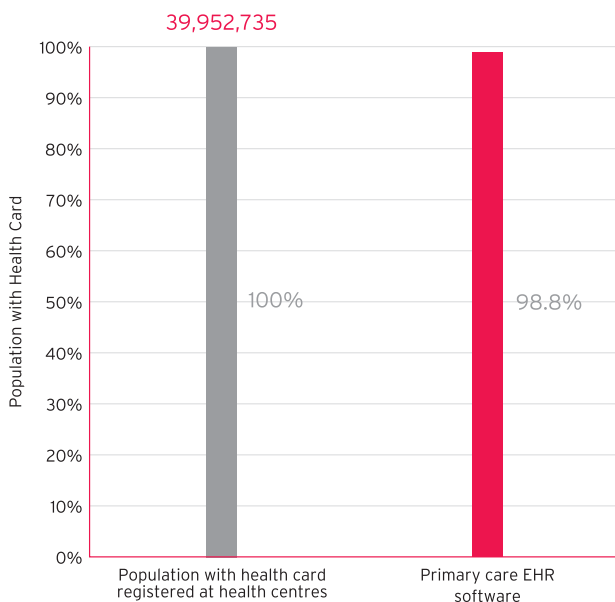
As has already been said, there is a solid implementation of information systems in National Health System primary care health centres, enabling 98.8% of the 40 million citizens registered at the health centres to receive healthcare services in centres that have these types of solutions.

As regards hospitals, 100% of the population receives healthcare services in hospitals that have a hospital information system, which manages patient admission,

beds, schedules, external consultancy appointments, clinical record files, emergencies and operating theatres. However, the percentage of the population whose health information can be consulted from centres belonging to different care levels is relatively low.

Lastly, 51% of the population with a health card (45.4 million) is cared for in hospitals with a homogenous hospital information system, implemented by each regional Health Service, which enables the hospital staff to view the various clinical events of the patient in specialized care and to manage patients' treatment orders or care plans.

Figure 24. Electronic clinical record in primary care health centres and population covered. National Health System 2007¹³

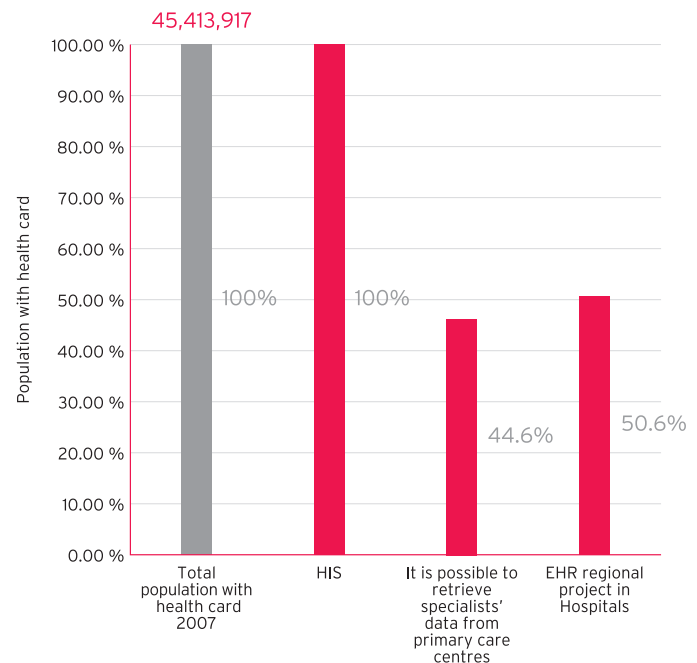


Source: red.es. From data supplied by the regional Departments of Health.

¹³ There are 5,325,569 people who are dealt with in surgeries.

¹⁴ The following information has not been included in the figure: HIS: Andalusia and Catalonia. Retrieve data of specialists from primary care centres: Region of Valencia and Basque Country. Review of Primary Care information from specialist centres: Region of Valencia and Catalonia. Regional EHR project in Hospitals: Andalusia.

Figure 25. Healthcare information systems and population covered. National Health System 2007¹⁴



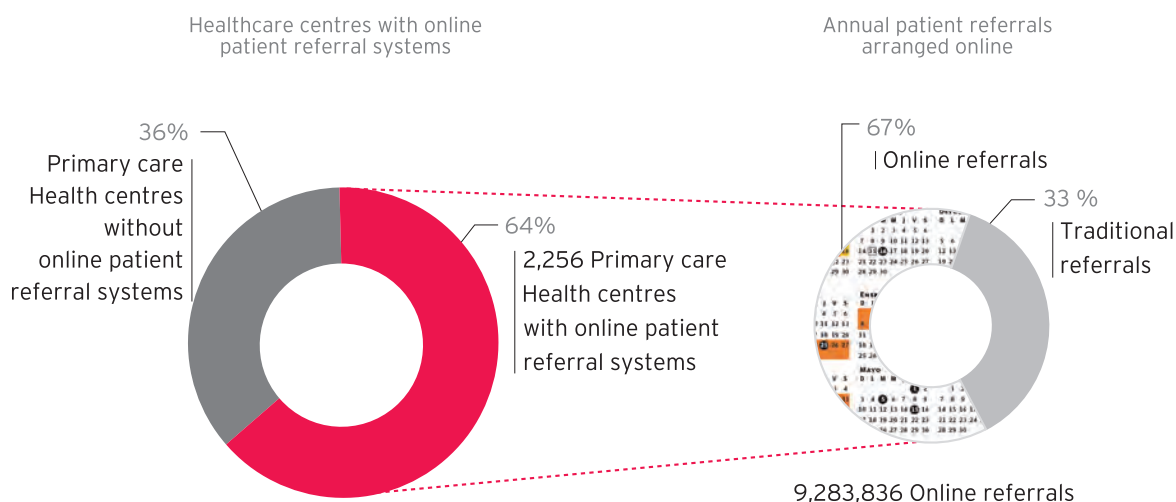
Source: red.es. From data supplied by the regional Departments of Health.

Finally, the main variables associated with the implementation and use of online systems for the management of appointments are presented. Two modalities of online appointments have been considered: the referral of patients from primary care to specialized care and the primary care appointment over the Internet. The unit of reference to measure the degree of availability and use of these systems was, as with many other parts of this study, the primary care health centres.

Currently, 64% of primary care health centres in the National Health System have the possibility of making referrals to specialists by electronic means. In total, 9.28 million appointments were made in 2007 through the regional Health Service intranets, that is, over 60% of all referrals made from primary care health centres during that same year. Figure 26.

The National Health System provides 21 million citizens with the possibility of making appointments with GPs and paediatricians over the Internet. This service was used very little in 2007, only 1.5% of appointments made that year were requested over the Internet. However, the implementation of this service is an investment for the future to satisfy the demand for online public services, which are expected to grow in the next few years.

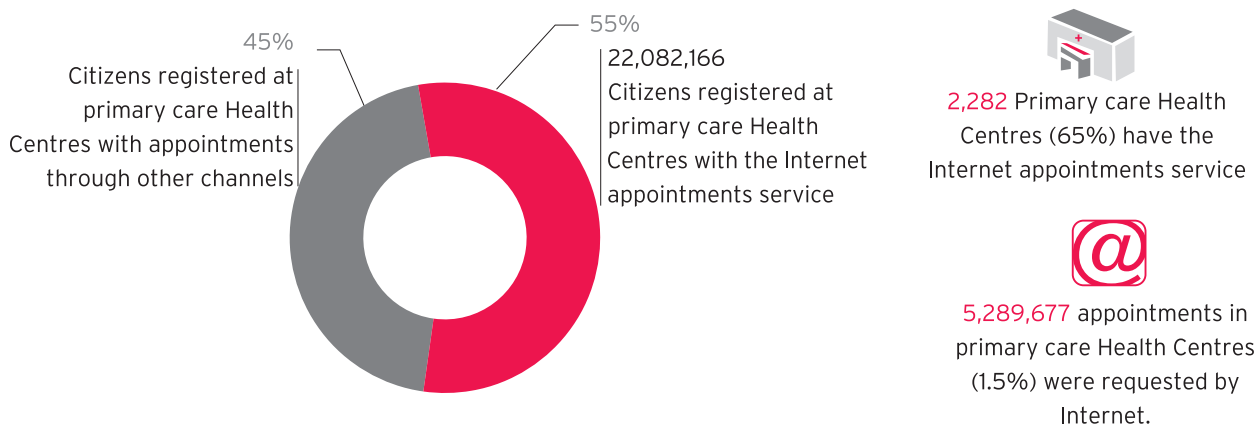
Figure 26. Inter-centre online referrals: implementation and use. National Health System 2007¹⁵



Source: red.es. From data supplied by the National Health System's Healthcare Services.

¹⁵ Information on the annual inter-centre appointments made online have not been included in the figure for Andalusia, Catalonia, Cantabria, Basque Country and Region of Valencia.

Figure 27. Appointments made by Internet for primary care health centres: Implementation, use and citizens benefiting. National Health System 2007¹⁶



Source: red.es. From data supplied by the National Health System's Healthcare Services.

4.4. Financial information

This section analyses financial information provided by the autonomous regions regarding their budgets for healthcare information and communication technologies in the last four years, 2004 to 2007 inclusive.

Autonomous regions were asked to divide their information into running expenses and investments, according to the following table¹⁷.

Over the period 2004-2007, investment and expenditure in the National Health System on information and communication technologies has doubled, going from €6

Categories	Definition
Investment in hardware	Investment in the acquisition of computer equipment, start up and roll out of several data processing centres and management of the Health Service's network electronics.
Investment in software	Investment in the acquisition of bespoke solutions and standard software licenses.
Expenditure on staff	Costs associated with the Health Department's in-house staff who carry out work related to the implementation, maintenance or management of these types of technologies and/or their content.
Expenditure on communications	Recurrent communications costs.
Expenditure on equipment leasing	Costs associated with monthly payments for leasing computer equipment (printers and PCs).
Expenditure on services	Costs derived from technical support as well as all the maintenance costs for hardware installed in healthcare centres and the Health Service's central services.

¹⁶ The information for Catalonia has not been included in the figure: citizens registered at the health centres that have an appointment by Internet service.

¹⁷ In the case of financial information from INGESA, Andalusia, Extremadura and the Region of Valencia, it was not possible to differentiate categories for expenses and investment. Cantabria has not provided the detail of the expenses categories.

ICT in the National Health System: The Healthcare Online programme

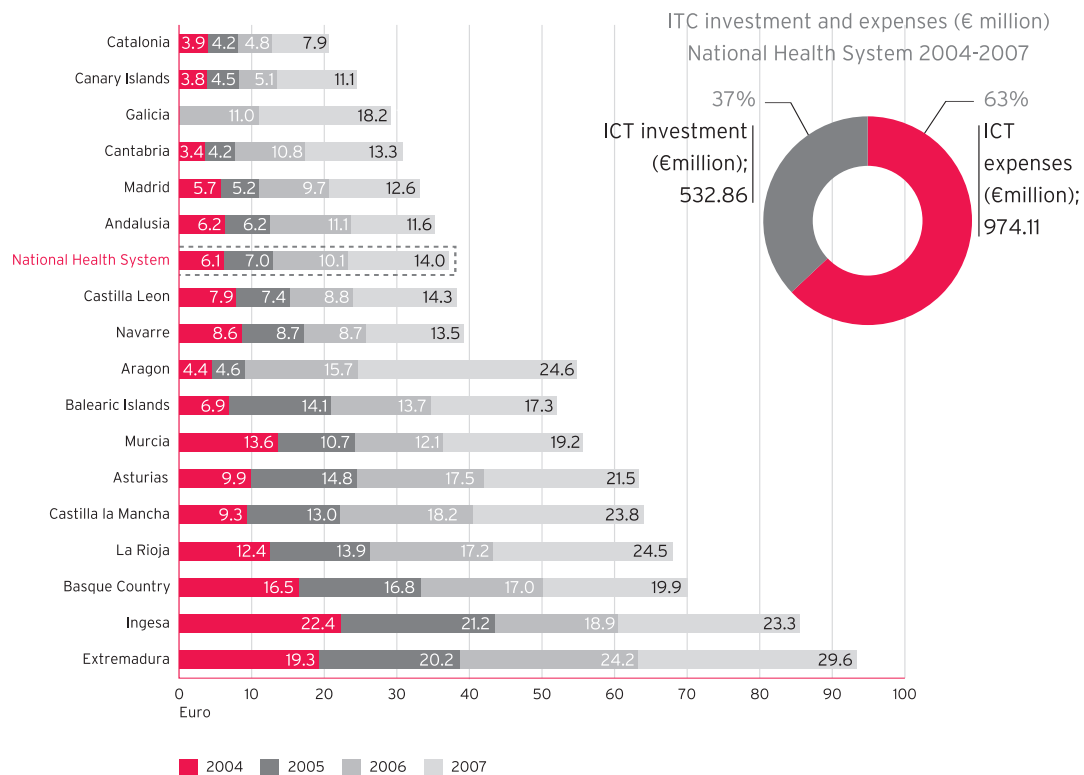
per capita in 2004 to €14 in 2007. In total, in the last four years, the healthcare administrations have used 63% of the resources for financing expenses and the remaining 37% for investment. Figure 28.

The expenses and investment in healthcare ICT in the National Health System represented 0.88% of the total healthcare budget for the whole of 2004-2007 period for all autonomous regions. Figure 29.

The following graphs show the financial data for the last two years (2006 and 2007). The investment made by red.es within the framework of the Avanza Plan has been included. Overall and until December 2007 this represented an additional €75.12 million. Figure 30.

The financial investment of the autonomous regions varies from €11.35 to €51.17 per citizen. On average, over the last two years, the National Health System has spent

Figure 28. Healthcare ICT investment¹⁸ and expenses per citizen (€). Period 2004 - 2007¹⁹

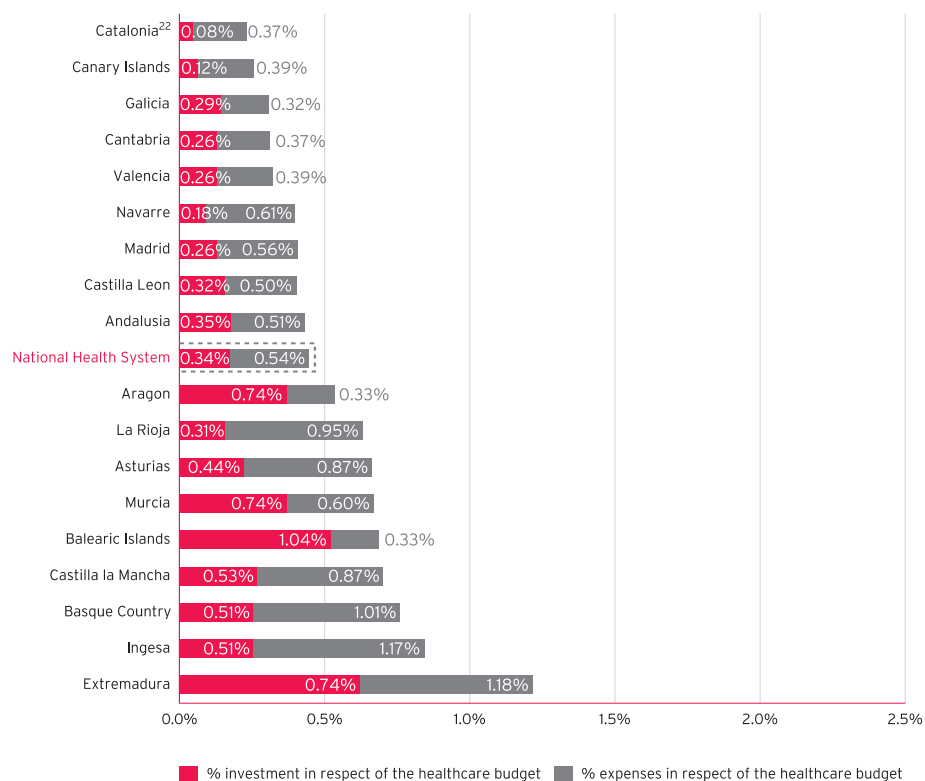


Source: red.es. From data supplied by the National Health System's Healthcare Services.

¹⁸ The amounts for the years 2006 and 2007 include the investment by red.es.

¹⁹ The information for Cantabria "healthcare ICT investment 2004-2005" and that for Galicia on "investment and expenses 2004-2005" is not available. For Catalonia, only information relating to the Catalan Institute of Health has been included.

Figure 29. Percentage of ICT investment²⁰ and expenses in the healthcare budget. Period 2004-2007²¹



Source: red.es. From data supplied by the National Health System's Healthcare Services.

€22.51 per citizen to develop and encourage healthcare ICT, of which €12.97 per citizen was for expenses and €9.54 corresponded to investment.

The investment made by red.es in this period, as is reflected in earlier pages, is 21.26% of the investment made by autonomous regions in the same period. The distribution of this investment between the various Health Services is shown in Figure 30.

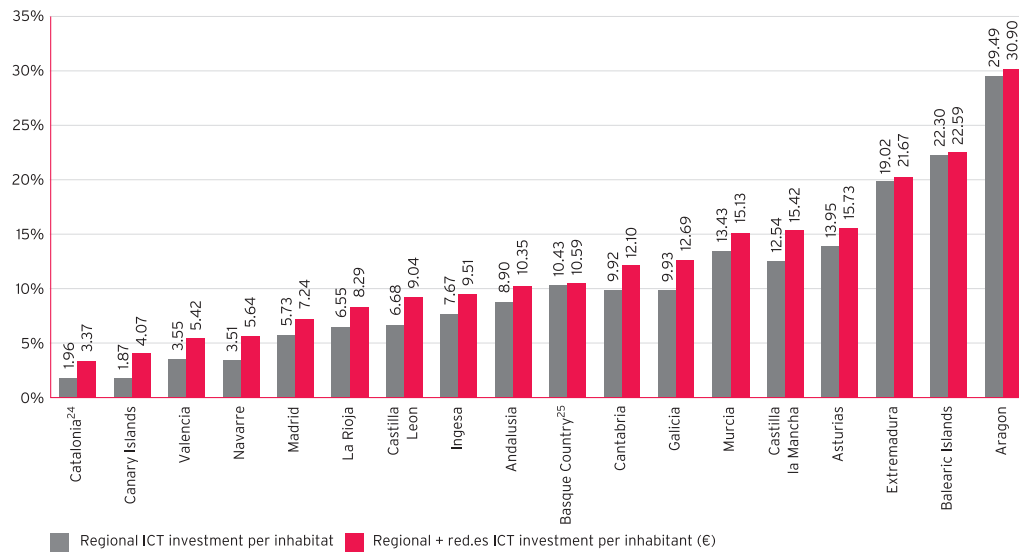
Figure 31 compares the investment and the expenses related to healthcare ICT in the National Health System as a whole, with the amount spent by each of autonomous regions and by INGESA. It should be taken into account that the information analysed corresponds to a short observation period (the two years 2006-2007) compared with the long timescales that are required for the implementation of information technologies in the areas of healthcare.

²⁰ The quantities for the years 2006 and 2007 include the investment by red.es.

²¹ The information for Cantabria "healthcare ICT investment 2004-2005" and that for Galicia "investment and expenses 2004-2005" is not available.

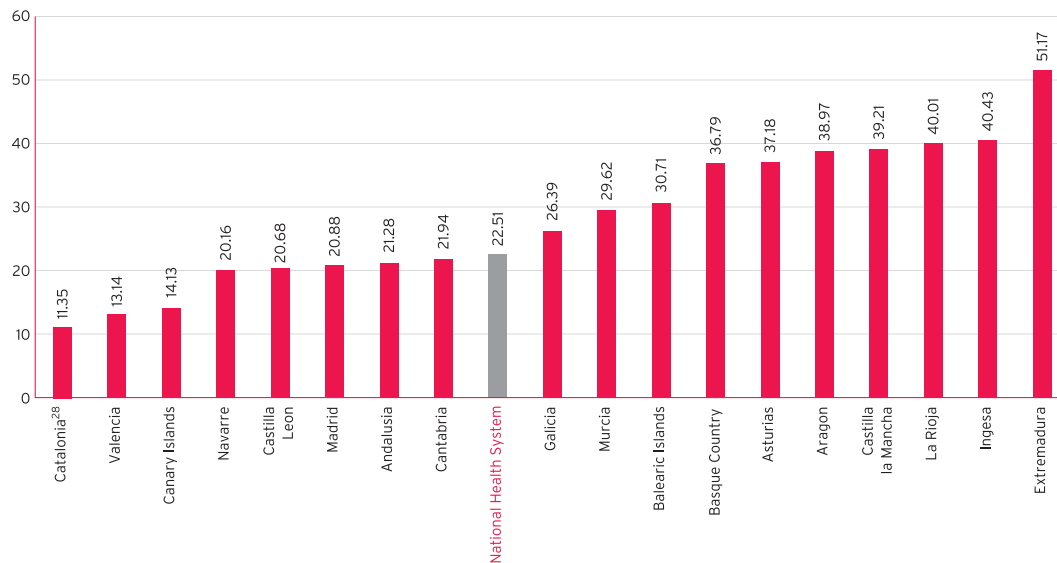
²² For Catalonia, only information relating to the Catalanian Institute of Health has been included.

Figure 30. Healthcare ICT investment per citizen²³ (€) 2006-2007



Source: red.es. From data supplied by the National Health System's Healthcare Services.

Figure 31. ICT investment²⁶ and expenses per citizen²⁷ (€) 2006 - 2007



Source: red.es. From data supplied by the National Health System's Healthcare Services.

²³ Average population, National Statistics Institute, for 2006 and 2007.

²⁴ For Catalonia, only information relating to the Catalanian Health Institute has been included.

²⁵ Due to the fact that the Basque Country was the last autonomous region to sign the bilateral agreement, the investment invoiced before the report cut-off date was very low, but actions corresponding to 100% of the investment have now started.

²⁶ The amounts for 2006 and 2007 include red.es investment.

²⁷ Average population, National Statistics Institute, for 2006 and 2007.

²⁸ For Catalonia, only information relating to the Catalanian Institute of Health has been included.

This publication is a summary of a much larger report entitled "ICTs in the National Health System". The initiative forms part of the monitoring process of the Avanza Plan's "Healthcare Online Programme", in which the Ministry of Health and Consumer Affairs (Ministerio de Sanidad y Consumo, MSC) and the Autonomous Regions collaborate alongside the Ministry of Industry Tourism and Commerce (Ministerio de Industria Turismo y Comercio, MITYC), acting through red.es. Its purpose is to make the information gathered during the Avanza Plan's Healthcare Online Programme available to all the agents involved. Additionally, data has also been collected that reflect the initiatives carried out over the last decade by the regional Departments of Health and the Healthcare Services in the Autonomous Regions and the boost these have given to the Healthcare Online Programme.

This publication has been possible thanks to the participation of the regional Departments of Health in the collection and analysis of

information. Their contribution has been crucial for us to describe the extent to which information and communication technologies have been introduced into the National Health System.

The deadline for compiling data was December 2007. The information gathered constitutes a tool that serves to determine the status of ICT technologies in the field of healthcare in our country. It highlights the work already carried out and serves as a reference for future measures.

International experiences in the field of eHealth confirm that aspects linked to system interoperability or change management are a constant in these initiatives, the success of which depends, to a large extent, on their incorporation into healthcare policies as an additional strategic element for bringing about changes and improvements in the healthcare system.

